

CLAIMS

1. An optical head for recording a signal in an optical recording medium or reproducing a signal recorded in the optical recording medium,  
5 the optical head comprising:  
a light source;  
an objective lens for focusing light emitted from the light source on the optical recording medium; and  
a tilt-related-aberration correcting means for correcting an  
10 aberration that occurs when the optical recording medium tilts,  
wherein a driving amount of the tilt-related-aberration correcting means is varied according to information concerning a tilt of the optical recording medium and information concerning a substrate thickness of the optical recording medium.  
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2. The optical head according to claim 1,  
wherein the tilt-related-aberration correcting means is a means for tilting the objective lens.
- 20 3. The optical head according to claim 2,  
wherein  
the objective lens has a certain set numerical aperture (NA), and  
a tilted amount of the objective lens is varied according to the substrate thickness of the optical recording medium.  
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4. The optical head according to claim 1,  
wherein the objective lens has a NA of not less than 0.7.
5. The optical head according to claim 1, further comprising a memory  
30 in which information concerning the driving amount of the tilt-related-aberration correcting means that is necessary for correcting an aberration that occurs due to a tilt of the optical recording medium is stored, the driving amount being determined according to the information concerning the tilt of the optical recording medium and the information  
35 concerning the substrate thickness of the optical recording medium,  
wherein  
information concerning the driving amount of the

tilt-related-aberration correcting means stored in the memory is retrieved according to the information concerning the tilt of the optical recording medium and the information concerning the substrate thickness of the optical recording medium, and

5           the tilt-related-aberration correcting means is driven according to the retrieved information.

6.       The optical head according to claim 1, further comprising a tilt detecting means for detecting information concerning the tilt of the optical  
10       recording medium.

7.       The optical head according to claim 6,  
          wherein the tilt detecting means comprises:

          a second light source different from said light source;  
15       a focusing lens for focusing light emitted from the second  
          light source on the optical recording medium; and  
          a photodetector for detecting light reflected by the optical  
          recording medium.

20       8.       The optical head according to claim 6,  
          wherein the tilt detecting means detects focus zero-crossing  
          positions at two certain points in a radial direction of the optical recording  
          medium, and detects a tilting amount of the optical recording medium based  
          on a difference between values of a focus search voltage at the two points,  
25       the focus search voltage being a voltage for detecting the focus zero-crossing  
          position.

9.       The optical head according to claim 1, further comprising a memory  
          in which information concerning the substrate thickness of the optical  
30       recording medium is stored.

10.      The optical head according to claim 1, further comprising a  
          substrate thickness detecting means for detecting information concerning  
          the substrate thickness of the optical recording medium.

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11.      The optical head according to claim 10,  
          wherein the substrate thickness detecting means comprises:

a second light source different from said light source;  
a focusing lens for focusing light emitted from the second  
light source on the optical recording medium; and  
a photodetector for detecting light reflected by the optical  
recording medium.

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12. The optical head according to claim 10,  
wherein the substrate thickness detecting means detects the  
information concerning the substrate thickness of the optical recording  
medium according to focal positions of two light beams, the two light beams  
being a first light beam on a side closer to an optical axis and a second light  
beam on an external side as compared with the first light beam.

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13. The optical head according to claim 1,  
wherein  
the tilt-related-aberration correcting means is formed with an  
optical element, the optical element comprising a pair of substrates having  
transparent conductive thin films, respectively, and a phase shifting layer  
interposed between the pair of substrates, and  
a pattern capable of correcting an aberration that occurs due to the  
tilt of the optical recording medium is formed on one of the conductive thin  
films.

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14. The optical head according to claim 1, further comprising a  
substrate-thickness-related-aberration correcting means for correcting an  
aberration that occurs due to a deviation of the substrate thickness of the  
optical recording medium from a standard value of the substrate thickness.

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15. The optical head according to claim 14,  
wherein the substrate-thickness-related-aberration correcting  
means comprises:

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a positive lens group and a negative lens group disposed in  
an optical path; and

a means for varying a lens distance between the positive lens  
group and the negative lens group.

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16. The optical head according to claim 14,

wherein

the substrate-thickness-related-aberration correcting means is formed with an optical element, the optical element comprising a pair of substrates having transparent conductive thin films, respectively, and a  
5 phase shifting layer interposed between the pair of substrates, and

a pattern capable of correcting an aberration that occurs relating to the substrate thickness of the optical recording medium is formed on one of the conductive thin films.

10 17. The optical head according to claim 14,  
wherein

the tilt-related-aberration correcting means and the substrate-thickness-related-aberration correcting means are formed with one optical element, the optical element comprising a pair of substrates  
15 having transparent conductive thin films, respectively, and a phase shifting layer interposed between the pair of substrates, and

a pattern capable of correcting an aberration that occurs relating to the substrate thickness of the optical recording medium is formed on one of the conductive thin films, and

20 a pattern capable of correcting an aberration that occurs due to the tilt of the optical recording medium is formed on the other conductive thin film.

25 18. The optical head according to any one of claims 13, 16, and 17,  
wherein the phase shifting layer is made of liquid crystal.

19. An aberration correcting method for correcting an aberration that occurs when an optical recording medium tilts, by using an optical head for recording a signal in the optical recording medium or reproducing a signal  
30 recorded in the optical recording medium, the optical head comprising:

a light source;

an objective lens for focusing light emitted from the light source on the optical recording medium; and

35 a tilt-related-aberration correcting means for  
correcting an aberration that occurs when the optical recording medium tilts,

the method comprising the step of driving the tilt-related-aberration

correcting means according to information concerning a tilt of the optical recording medium and information concerning a substrate thickness of the optical recording medium.

- 5    20.    An optical recording/reproducing device comprising an optical head for recording a signal in an optical recording medium or reproducing a signal recorded in the optical recording medium,

          wherein the optical head is the optical head according to any one of claims 1 to 18.

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**Written Amendment**  
(Amendment based on Section 11)

To Commissioner of the Japanese Patent Office

**1. Identification of the International Application**  
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**4. Object of Amendment: Claims**

**5. Contents of Amendment**

(1) As shown in a separate sheet, we amend claim 1, claim 5 and claim 19.

**6. List of appended documents**

New pages 29, 30, 32 and 33, Claims